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ABSTRACT

This paper discusses technological change and its impact upon society and the educational system. Part I discusses the role of advanced and advancing technologies such as microelectronics and the impact they have had in society and their potential for increasing productivity and economic competitiveness. The section goes on to highlight some of the social costs and benefits of the advances in high technology fields. Part II describes dangers involved in developing appropriate technology, particularly the tendencies towards elitism and the fear of technological change. In addition, this section discusses ways of coping with change, the effects of technological advancements on the quality of life, and some of the educational reform strategies designed to cope with technological change including linking up with other institutions and developing better cooperation with business and industry. Part III outlines some of the strategies and goals that the College of Lake County has developed to confront the issue of technological change, focusing on the areas of information skills, liberal arts and sciences, advanced technology, computer competency, enrollments management, economic development, contractual programs, and inter-institutional cooperation. Finally, this section discusses major issues of student needs with respect to access, appropriate standards, and the development of a meaningful curriculum. (HB)

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TECHNOLOGICAL CHANGE

&

EDUCATIONAL REFORM

BY

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Technological Change and Educational Reform

I

IBM's Director of University Relations, Louis Robinson, told the story of a man who goes to work each morning in the heart of New York's garment district. When he arrives at his work place, he pulls out a bolt of cloth and spreads it on a table. Hovering over this table is a device that looks like a movable x-ray machine. The device is connected to a computer. It scans the cloth looking for imperfections and feeds this information into the computer. The man then feeds in more data from an order form he has specifying measurements for a man's suit. When all the adjustments are made, the computing machine lays out a pattern on the cloth, carefully avoiding the identified fabric imperfections. When that is done, the man presses another button and a laser beam comes out and cuts the cloth.

When the man goes home at night, and someone asks what he does for a living, he says, "I'm a tailor."

There are many such stories about the role of computers in our rapidly changing work force. There is less public attention paid to other advanced technologies which may have equal or greater long-term effects. But most of us are aware that we are involved in a new era of technological development which is having a dramatic impact on jobs and our daily lives. It is also producing a fair share of myths about technology that can lead us into poor personal decisions as well as bad investments. Many technological forecasts have not proved out in the predicted time frame. On a deper level, fascination with new technological wizardries can lead to a view of "technological man," a view which has always been dehumanizing.

The new technologies harbor both great promise and a high degree of social peril. How well shall we exploit the promise and avoid the peril depends upon education. Technological change has profound implications for education in the rest of this century, and positive educational outcomes are not guaranteed.

The challenge to education should not be left just to our schools and colleges. The vitality of America's work force in all areas of industry and public service is at stake as well as the welfare of our communities. First, we need to understand the inter-institutional and inter-community nature of the challenge. Then, we must find ways to enhance cooperation

among educational institutions and with other knowledge industries in heading toward strategies of reform and revitalization. These are the keys to educational excellence in our generation.

Advanced/Advancing Technology

If we are witnessing a technological revolution, center stage has been occupied so far by the microelectronic industries. Microelectronics is both a force in itself and a catalyst for the convergence of other technologies, such as information processing, telecommunications, robotics, and artificial intelligence. Historically considered, this is the third stage of the great industrial revolution which had major thrust in the 19th century, moved to an even higher level of accelerated change in the 20th century through the inception of mass production and consumption techniques, and now confronts us with a less visible but just as powerful change through the marvels of the "microchip."

Microelectronics gives us exponentially increasing speed in information processing and communication with a corresponding decrease in the size and cost of the "hardware" used. Computers are made of "semi-conductor" devices. A recent estimate from Arthur D. Little, Inc. shows that a batch of semi-conductors costing $1,000 in 1975 will cost $80 in 1985 and $5 in 1995. At the same time, if this batch of semi-conductors had a relative speed of one in 1975, it should have a speed of ten in 1985, and a speed of sixty in 1995.

These figures relate primarily to the development of small personal computers. At the other end of the scale are "super computers" -- a field in which the University of Illinois is taking world class leadership -- where the speed of processing is measured in units of one billionth of a second and the increase over the old "mainframe" computers is at a factor of one million. Larger systems can also be linked to personal computers. All of this means that computing capacity is no longer a problem and computers shall continue to saturate our environment.

As we are dazzled by these more powerful and faster computers, other new products are changing our work pattern and relationships and even changing the landscape. For example, optical fiber (a thin filament capable of carrying over 400 million pieces if information per second) can give us new systems and networks for voice and data communications -- without telephone poles.

Fiber optics is one of the technologies in the burgeoning telecommunications field. We also see signs of telecommunication development in the satellite dishes which are spreading everywhere. Satellite communiations began

through NASA in the 1960's. The commercial applications are just beginning to mature. A current project called "Geostar" at Princeton University is aimed at putting the average citizen in direct contact with satellites through a pocket-sized, battery-powered transceiver. This technology is even more remarkable in its potential than the video communication made possible through today's satellite dish. It is predicted that by the 21st century video communication shall be possible with any other person or information source anywhere on earth.

Other change processes are even less visible to the naked eye. The invisible foundation of new production and service systems shall continue to cause the replacement of many of our "smoke-stack" factories, already disappearing. Our great steel industries, for example, have always relied upon energy-intensive ore smelting and refining processes, employing millions of miners and steel workers.

The workers of the future may be microbes, says Arpad Torma of the New Mexico Institute of Mining and Technology. New bioengineering technology, spurred by genetics research, uses bacteria that eats sulfer ions in ore and leave metals as a by-product. Similar techniques can now be used to retrieve lost crude oil from abandoned wells. It is unlikely that this technology shall have significant impact on industries until the 21st century, but today's elementary school child may see bio-technology occupying center stage in his adulthood as electronics does today. The life sciences and bio-technology may provide entirely new strategies for treating disease, increasing food production, and cleaning up the environment. Again, however, there is a peril along with the promise; serious questions about safety, ethics, and morality accompany this development.

We need not look into the future to see the permanent change being brought about by electronics, however. As this article was being written, Illinois was making a major effort to win the location of a new General Motors plant. This fully automated facility, the Saturn project, is a model of new technology called CIM - Computer Integrated Manufacturing. It is understandable why Illinois needs the plant. Initially, 6,000 workers shall be employed.

CIM is our new industrial base. CIM models involve the integration of computer assisted engineering (CAE), computer aided design (CAD), and computer aided manufacturing (CAM). These models illustrate how production time and costs can be decreased while quality control and product diversity are increased at the same time.

To exemplify on a very minor scale, notice that bookstores now sell books in the same printing but with different covers. Suppose that in similar fashion it is possible to customize hand tools or other such products so that instead of 1,000 units produced, ten different groups of 100 units each can be produced at the same cost, with better precision. This is possible through CAD/CAM applications. The capability now exists to reduce the engineering, design, testing and manufacturing cycles from years to months and from months to weeks. Consider the edge that such capabilities would give the producer in the market place.

It is now clearly evident that the future strategies of our manufacturing industries are geared to automation in order to achieve these productivity results. In addition to the GM Saturn project, other prime examples are:

- General Electric's locomotive plant in Erie, Pennsylvania has flexible manufacturing systems which have reduced production time from 16 days to 16 hours.
- Chrysler's Sterling Heights, Michigan plant will use over 100 robots in the production of H body automobiles.
- Pratt Whitney's plant in Columbus, Georgia will produce aircraft engine disks completely under computer control.
- Building Systems Company of Hartford, Connecticut (a subsidary of United Technologies Corp.) is designing buildings by CAD to have automated systems for energy conservation, maintenence inspection, information processing and building communication, security and automatic fire control.

The last model industry cited above provides an excellent example of how technologies are converging. These "intelligent" buildings are equipped with computers and fiber optic cables for telecommunication capability obtained through partnership with AT & T Information Systems. Dubbed "Share Tech," none of the technologies employed are new breakthroughs but as an integrated package, this kind of architecture is revolutionary. These buildings of the future are already being constructed in Hartford, Dallas, Washington D.C., and Chicago.

Here in Lake County, Abbott Lab's North Chicago Cephalosporin plant is a good example of an automated facility. In addition to the development of automated manufacturing systems by anchor industries such as Abbott, a strong entrepreneurial development of new industries -- and job opportunities -- is underway, fueled by the productivity gains of advanced technology.

The application of these technologies in the workplace is American industry's hope for increasing productivity and regaining the competitive edge it once had in world markets. Economic growth -- and jobs for American workers -- depend vitally on the technology transfer.

Social Costs

It is by no means certain, however, that continuing advances in high technology fields shall lead to an overall increase of jobs requiring workers with sophisticated skills. What are the jobs? What skills are required?

The answers are not easy to come by. Examples abound of worker transcience and job obsolescence in the work world, and advancing technology is likely to continue the short life of specialized occupations. Technological forecasting has not been a reliable means for knowing what specific jobs shall be available in the future. Furthermore, those studies dealing with the impact of technology on the workplace often reach conflicting conclusions. One recent study by Yankelovich and Inmerwahr, for example, found that technological change improves worker satisfaction and discretion. On the other hand, a Stanford University study concluded the opposite, arguing that technology can lead to "de-skilling."

Historically, technological innovations has led to more jobs and higher pay despite the temporary cost of worker dislocation. The application of today's technology, however, may not support this premise. Contrary evidence may be seen in those plants, such as the GE locomotive facility mentioned above, where robotic application reduced a department's employees by eighty percent. Similar reductions have been reported in Japanese plants, although unemployment in Japan is not as serious as it is in the U.S. An average of recent estimates is that Japan has 35,000 robots in place; U.S. industry has only 8,000 but the projected number by 1995 is 150,000. What are the implications for the manufacturing work force?

With automation, there is little question that the demand for managerial skills combined with technical expertise shall increase. These jobs shall require more education and training. The greatest growth of jobs however, is likely to be in service fields requiring less sophisticated skills.

Overall, labor projections look good for the next decade, but there is a twist. The U.S. Department of Labor projects that the greatest number of new jobs shall be for secretaries, cashiers, sales clerks, nurses, and building custodians. High tech occupations are projected to expand also, but the numbers are dwarfed by lower paying service occupations. High paying blue collar occupations shall continue to decline.

Even in discounting the accuracy of these projections, as we should, it remains highly probable that social problems of underemployment of skilled workers shall ensue for the next decade, further compounding the already serious problems of worker dislocation and unemployment caused by adjustment to the new economy. Nor is that economy secure in either the private or public sector. Labor unions -- which generally have not been reluctant to participate in strategies for workplace transformation -- are quick to point out, nevertheless, that robots do not buy houses or pay taxes.

Thus, we are facing dilemmas which go beyond the mission of schools and colleges to resolve. Yet, more so than ever before, education must be in the forefront of our society's efforts to define and cope with perplexing realities of change.

If education is preparation for the future, how shall our students be prepared, and for what? If education is a means for improving the quality of life, what questions need to be raised in the curriculum and on the public agenda about advancing technology? If education is a measure for reality-testing, how shall it keep pace with new technology?

In the next article in this series, I shall attempt to suggest some answers to these questions.

Technological Change and Educational Reform
II

A difficult lesson to get across is that understanding technology is not the same thing as understanding the impact of technology on our society. The new technological foundations of our society are being created by an explosion of scientific knowledge and engineering skills. There are issues in science and engineering education too, but the broader issues of assessing and controlling technology ultimately belong in general education simply because there are value decisions and trade-offs to be made which affect all of us. In a free society, there are two dangers to be avoided as we try to develop appropriate technology.

The first danger begins with the ignorant assumption that scientists and professional engineers are not concerned about our environment or the quality of life and therefore cannot be trusted. This is the "Dr. Strangelove" image which is revealed in ideological and religious apocalyptic messages and in popular misconceptions about humanoid computers and robots. This is dangerous because it distorts what science is and how knowledge is created, thus placing ankle-chains on our maturity. Just as we cannot gain technology's benefits, neither can we control it, if we do not rely upon scientific and technical expertise.

The second danger may be even greater, however. In discussions of technology, there is often an elitist assumption that only technologists can grasp its impact and therefore should be called upon to make social, political and even ethical-moral decisions in matters which the rest of us are incompetent to judge. This is technocracy. As a governance system, it is dangerous because it leads to images of the future tied to technological salvation.

This vision has always betrayed mankind. Since the building of the ancient pyramids to modern space weapons, it is fashioned on an old doctrine of technological man which prevents complete human development, de-justifying his claims on spriritual life and separating man from God.

In a free society striving for economic development through technology and struggling with quality of life concerns -- a

constant drama of search and balance -- the first requirement is *to not give up on the complexities.* In any democratic community, this requirement falls on all responsible citizens. In a school or college, it becomes more than a requirement of citizenship; it is part of the mission -- perhaps the most noble aim of education -- to teach us to see life steadily and see it whole.

Coping with Change

Sometimes, as we see and hear of the ravage of drugs and alcohol, the question naturally occurs; are we still dealing with healthy people in our educational institutions? My answer is, with the great majority of students, emphatically yes! If this answer were wrong, we would need an entirely different theme than "coping with change." Only healthy people can cope with the pace of contemporary change. But this does not mean that they *shall* cope. To cope means to have skills, imagination, and perspective. These are also the traits of the educated person. In this sense, education is distinguished from training.

People can be trained to do a specific job, but what happens when that job is no longer there? The urgent expressions of need for an upgraded work force coming from business, industry, and the military consistently point out the value of these kinds of attributes: ability to communicate -- computational ability -- creative and adaptive capacity -- interpersonal skills -- critical thinking skills -- brightness and alertness.

People with these attributes are in demand. Employers know that such employees are also more motivated, more reliable, and more trainable. In the future, it is likely that these skilled *people* (as distinguished from skilled *workers*) shall be in even greater demand as machines take over most of the mundane and repetitious tasks in the workplace. The $64,000 question is, how shall the workforce be created?

As in other organizations, there is a tendency in schools and colleges to separate people by their functions. Faculty teach, students learn, administrators supervise, etc. Every organization requires functional analysis and delegation of responsibility. In educational institutions especially, however, we cannot avoid the proposition that we are *all students*, or should be. How well schools and colleges shall develop qualitatively depends to a large degree on how seriously this proposition is taken throughout the organization. I believe that in two senses this is the main criterion by which educational institutions shall ultimately be measured for their contributions to a new work force.

First, the desire to learn is infectious. Computer assisted instruction and other instructional technologies have been shown to quicken the rate of learning and should be employed, but it is still the enthusiasm and example we bring to our relationships with others in a learning environment that best motivates us and them.

Second, the speed at which knowledge is increasing in nearly all fields means that the teacher who is not also a student can too easily become isolated from the body of knowledge and techniques he is teaching. Scientific knowledge is doubling every five years. The application of that knowledge -- technology -- is also faster, as is the transfer of that technology to the workplace. Recent estimates are that, despite transfer problems, the time lag between technological innovation and its direct application to industry has shrunk from over ten years to less than five years in the past decade.

In a technology-intensive society, we are faced with a learning imperative. This means that students must have mastery of basic skills -- reading, writing, speaking, listening, and computation -- which are then honed as critical and creative thinking skills. It also means that learning cannot be confined to a place and time in our lives. Formal learning is a life-long process. We are never too old to start, but we are always too young to finish.

Some people say, I cannot learn, it's too difficult. Not so! It's a matter of getting started right. The more we learn, the easier it is to learn. It is only when we decide to take a break from learning that we begin to falter and stagnate.

Well educated people understand this imperative and naturally live by it. Continuing education becomes part of their life-style. It is ironic, perhaps, that educated people take advantage of educational opportunities while the non-educated are not interested and fall further behind.

Quality of Life

Our ability to adapt and learn depends upon our personal skills. Quality of life decisions depend upon what we know. If the purpose of education is to improve the quality of life, the curriculum -- courses taught -- becomes a paramount consideration.

Curriculum design is a topic too broad to be covered here. In respect to technology assessment and control, however, there is an aspect of curriculum design which is increasingly important from grade school through college. Bottom line, it is a matter of teaching ethics.

By ethics, I don't mean preaching or propagandizing in the classroom -- of which there is probably too much already -- but the principles and concepts involved in deciding means and ends. In short, it is the judgement of values and obligations. Philosophically, the inquiry begins with the fundamental question, "What is the good life?"

I believe that every college student should enroll in a Philosophy of Ethics course, but more importantly, ethical principles and concepts need to be introduced in a wide range of courses, from business to government to biology. Why is it becoming more important in dealing with technology?

Consider the emerging field of genetic engineering. In this field, there are ethical questions, which molecular biologists have framed, but which are also deserving of public attention. For example, should gene therapy -- curing genetic diseases -- be attempted? It likely soon shall be, but the deeper side of the question is, under what conditions and by what procedure? What regulation is necessary?

The answers to such questions must be given in a way which is reassuring of the public interest. Many of the early safety concerns in this field have been satisfied by additional knowledge as research has proceeded. In this sense, pursuing knowledge is itself an ethical imperative. But again, when the issues are obviously ethical and moral in nature, science and technology cannot be left alone. Building an agenda along these lines for the classroom and the public forum is not an attack on the empathy or integrity of scientists and engineers. It has simply become a necessary part of general education.

While doing post-graduate work at Harvard University in 1976, I had the opportunity to witness an exemplary approach to the public handling of such issues. A city building permit for a recombinant DNA (genetic engineering) lab was required. This need brought Harvard scientists into debate with the Cambridge City Council. In leading this process, the Cambridg mayor showed remarkable patience and common sense. He controlled the inquiry but demanded straight answers. Outside of chambers, he arranged a public fair where the scientists could discuss one-on-one with lay citizens and answer their questions. Education was on the line. In these affairs, this kind of political leadership is as important as scientific leadership. Both are crucial to enlightenment and public trust. Education is their bond.

Advancing technology provides numerous examples of how dependent we are on knowledge and ethics. Consider government and public policy. At the federal level there is

debate on public policy (or lack of it) for structuring the transfer of technology. It is now recognized, for example, that the capability to merge voice and data communications is not encouraged by current regulatory structure. In the old days, the regulatory structure of the Federal Communications Commission for telephonic and broadcast matters; Postal Commision for mail; etc. was clear-cut. Just as clearly, this traditional structure is not going to work if the convergence potential of the new related technologies is to be exploited. If not, we lose further to the Japanese. Already, we seem to be losing the technological drive as they give us the technology, and we do the assembly and the distribution.

But wait. Should these reguations then simply be placed in the hands of corporate policy-makers who have the most to gain? What about competition and work force values? What about environmental considerations?

These are complex and difficult questions, but they are on the agenda. Decisions shall be made -- even *not* to decide is a decision -- and those decisions affect all of us.

Daniel Yankelovich probably knows more about public opinion and consensus than anybody else. He believes that Americans are more and more ready to make hard decisions about economic, environmental and public policy issues. He also says that we need to find more effective ways of reaching consensus. There is a lot of evidence that he is right on both counts.

There are resources for communicating about technology. Notice the growing number of new magazines on science and technology and the coverage on television and in the newpapers of science and technology issues. But the cause of effective and ethical use of technology begins in our schools and colleges.

Reform Strategies

One of the problems in dealing with the complexities of change in schools and colleges is that the curriculum has become fractionated along specialized lines. There are too many social service and "junk" courses so that there is no core curriculum that concentrates on basic and life-long learning skills. The second problem is that public education is isolated from other knowledge industries which are rapidly growing.

The first problem is now well recognized, and there are reform measures being introduced in most institutions. It is coming none too soon. In recent comparisons between American students and those from other industrialized nations, our kids have consistently placed last. But the lack of

remediation has not been just in the schools; community colleges and universities have also failed until recently to face up to the problems. Standardized college test scores have also declined over the past twenty years. Illiteracy and incompetency have been growing, not receding, despite more diplomas and degrees conferred.

Failure to remediate is tragic: without skills for learning and coping with change, people are condemned to a life without opportunity, and the consequences for the national welfare are grave. What greater travesty could be committed by an educational institution than to "educate" without giving hope that it makes any difference?

Given the inequities of community and home life, the spectrum of demands and obligations, and the inter-institutional nature of these problems, it is not easy to address them. External pressures for action have increased enormously, but there is serious question as to the value of some of the current legislative proposals.

The State of Illinois faces a test of balance in its current education policy formulation. Financial support and consolidation needs attention. The driving force for curriculum and instruction reform, on the other hand, should come from within schools and colleges. They can grow best if there is strong local governance and administration. Without a balance of state support and local autonomy, the best intended reform policies are likely to fail. Yet it is understandable why more public accountablity is in demand.

Much depends, therefore, on education policy which pushes for curriculum reform, especially basic skills revitalization, without killing the spirit of it. Effective institutions do not need legislation reform, and there is real danger in stifling innovation if mechanical solutions are imposed. There is already sufficient evidence that legislated requirements conflict with qualitative growth.

In order to achieve curriculum results, however, educational institutions must learn how to link up with each other to meet common needs and, secondarily, how to tap the humen resources and support of business and industry which also have a stake in the results and should be proactive. The latter relationship with firms oriented to information and knowledge (for example, Illinois Bell) can be particularly beneficial to colleges.

Schools and colleges face the same problems and should do so together. Inter-institutional cooperation is possible on many fronts. One example is partnership between Area Vocational

Centers or high schools with vocational/technical programs and community colleges. Other than traditional jurisdiction, there seems to be no major obstacle to designing completely integrated programs for advancing students, from pre-technology to technology for example, over four years -- final two years of high school and two years of college. Following achievement of the associate degree, the student would have the option of transferring to a university for baccalaureate completion.

This inter-institutional effort would be aimed directly at meeting the needs for employable skills of the great middle category of young students who are often directionless when they leave high school. It would begin to mandate further education and training at least to the community college level. It may also create opportunities for more cooperative approaches to the remedical and developmental needs of older clienteles.

Better cooperation with business and industry can be achieved if there is a mutual regard for economic development as the key strategy. Not all industries are interested in economic development other than their own, but the best interests of business, industry and the community-at-large are served in having a skilled and reliable work force. Current studies indicate that a skilled work force is one of the chief criteria for decisions to locate or expand industry. These vested interests can be coordinated through economic development policies which stress the availability and accessibility of high quality education and training.

At the same time, educational institutions should not allow themselves to fall into an old trap of promising more than they can deliver according to their missions. Education cannot create jobs by itself or solve all of a community's social problems. Post-secondary institutions, at least, have a responsibility to join a partnership with the rest of the community for economic development, but the responsibility is mutual. Community colleges especially must be geared for this effort to achieve partnership. An outward reaching community college is a prime asset for economic deveolpment.

In the final article in this series, I shall outline some of the strategies and goals of the College of Lake County as we attempt to join the issues of technological change.

Technological Change and Educational Reform III

How does a free society cope with change? One of the ways is through education. In its truest sense, education focuses on the phenomenon of change by relating the past, present and future. If we allow ourselves to see only the present and become titillated by the appearance of new things, we miss the underlying causes of change. It then becomes more difficult to cope. Sometimes a "new wave" is only a fad which misleads us. On the other hand, it is also misleading to assume that somehow things will always be the same. In a profound cosmic sense, this may be true; the deepest currents of history move slowly. But at the experiential level, change in our time is a roaring current.

It is difficult to be absolutely certain about change because we cannot predict the future, but education which sharpens our critical thinking skills is a distinct advantage in helping us to keep a balanced view. This kind of education is found in many different forms, not exclusively in the classroom. It is, however, what college classroom instructors strive for.

The math instructor wants his students to be able to apply a formula, not merely memorize it. The technology instructor wants his students to understand the technology, not just the equipment. The business instructor wants his students to apply management principles in a case study. The science instructor wants his students to apply a laboratory technique; and so it goes. Such application involves critical thinking.

This kind of education has always been highly valued in colleges and universities. There has always been a lot of debate about how to get it done while giving students other knowledge and preparation for specific fields at the same time. It is quite a challenge.

About twenty-five years ago, a new sector of higher education began to develop very fast. These new institutions -- the public community colleges -- are trying their hand at the same challenge but doing it in different ways.

Public community colleges -- sometimes erroneously called "junior colleges" or "two-year colleges" -- are an American invention. They are promulgated on the democratic faith in education for upward mobility and propelled by the egalitarian force of opportunity for all citizens. One of these institutions is the College of Lake County.

The College of Lake County belongs to the people of Lake County; its governing board is elected by Lake County citizens. As a *community-based* institution, its mission is to serve the needs of Lake County and to provide post-secondary educational opportunity for *all* of its adult population. It is, therefore, a *comprehensive* teaching institution, offering a wide variety of accessible and affordable programs in vocational/technical fields, baccalaureate transfer, and adult/continuing education. To maximize the available opportunities at local tuition rates, the college has inter-institutional agreements with all neighboring community colleges, including Gateway Technical Institute in Kenosha, Wisconsin. Tuition is the lowest of any college or university within commuting distance.

The college also has significant contractual relationships, including the largest federal contract for military instruction in the nation. This contract has established the CLC Naval Training School at Great Lakes Naval Base and in San Diego and Hawaii. Other contractual programs are conducted at Fort Sheridan and with several business firms and social agencies throughout the country. If people served through contractual programs are added to those in regular degree programs, the college headcount enrollment is approximately 45,000 students per year.

The Spanish philosopher, Ortega y Gasset, once said, "The institution which feigns to give and to require what it cannot is false and demoralized." We take this warning very seriously at the College of Lake County. At the same time, we believe that the future should be faced aggressively and positively. Planning and evaluation are constantly conducted. The purpose is to continue the college development in accordance with its resources and the county's emerging needs while maintaining high quality in the delivery of programs and services. To assist in these efforts, the college has an extensive network of advisory committees.

College at New Plateau

The past five years of the college development have been marked by strong physical, technological and enrollment expansion. Major new facilities have been added, including the Learning Resource Center, Lakeshore Educational Center (soon to become a branch campus), Physical Education Center and the Highland Park Services Center. New programs have also been added, and major organizational changes have been made. With the support of the CLC Foundation, a Community Gallery of Art has been established, and cultural activities have been expanded. Enrollments have steadily increased and are now leveling off.

Extension centers to foster open campus delivery systems, combined with new strategies for economic development and inter-institutional cooperation, have pushed the college outward to the entire county. Finally, the college has taken national leadership among community colleges in its partnership with the U.S. Navy.

This year's planning projects included two of considreable complexity and scope. One concerns a new Science/Student Services building on the main campus; construction shall begin this month. The other concerns fundamental changes in basic skills testing and placement of students under new admission policies. The completion of these planning projects signals the end of a stage of development. The college is now at a new plateau.

New Strategies and Goals

The college mission is broad, and it is difficult to communicate in all areas of development. Briefly outlined, following are some of the new strategies and goals for addressing major needs that have surfaced through internal and external assessment.

1. ***Information Skills***

   Because of the paramount importance of information skills -- abilities to read, compute, interpret, analyze, and communicate in both oral and written form -- new emphasis is being placed on this aspect of curriculum and instruction.

   Goals include writing-across-the-curriculum, enhancement of basic skills courses, basic computer training, greater learning assistance, and focused literacy and critical thinking skills projects. These are faculty initiated goals in nearly all departments, for which increased program and staff development resources are committed.

2. ***Liberal Arts and Sciences***

   Following revision last year of curriculum requirements for baccalaureate transfer programs, the identity and integrity of the liberal arts and sciences as a program will be given continuing attention.

   Goals include the development of an honors program, for which a faculty has been appointed; revitalization of CLC theater, in the context of a major institutional commitment to planning a new Performing Arts Center; and, of course, the enhancement of the biological sciences with first class laboratories in the new Science building.

3. ***Advanced Technology***

   The college is taking a leadership position among colleges and universities in the creation of two technology centers: the Automated Industrial Center, which is a model of

Computer Integrated Manufacturing (CIM); and the Software Development Center, under jurisdiction of the Electronics Department, for which major investment in advanced computer equipment is planned for next fiscal year.

Other goals include enhancement of the automotive technology, medical records technology, and radiography technology programs. Strategic planning for new biotechnology programs is underway.

4. ***Computer Competency***

Three years ago, the college had half a dozen microcomputers on campus; today there are approximately 150 for student and faculty use.

Goals include continued emphasis on personal computer instruction throughout the college and moving toward a universal basic skills requirement. New computer labs are planned for the Business Division and the Lakeshore Center in the next fiscal year.

5. ***Enrollments Management***

This strategy refers to the array of techniques, procedures, and activities through which the college can position itself to identify student clienteles and serve an optimal number of students in keeping with its resources. In the development of an information base for this purpose, a Gallup survey of the entire county was completed last year.

Among goals involving all areas of the college in specific enrollments management projects, special consideration is being given to expansion of programs for South Lake County. A new advisory committee has been established for the southwest region.

6. ***Economic Development***

Through its Economic Development Center, the college shall continue to play a leading role, in cooperation with other agencies, in the county's development.

A major new goal concerns the creation of a Small Business Development Center.

7. ***Contractual Programs***

A composite strategy for partnership with military institutions is being developed. Because of the crucial importance to Lake County of the Great Lakes Naval Base, this strategy shall seek broad political support.

The goals are to turn the corner from training to education in contracted programs by focusing on course credentialing and staff development, and to demonstrate in a compelling way the cost-effective, qualitative nature of CLC involvement.

8. *Inter-Institutional Cooperation*

The college is fortunate to have excellent relations with other fine educational institutions in the region, especially the Area Vocational Center and Lake County high schools. The college is committed to continued cooperation and exploration with its sister institutions for delivering educational excellence.

A mutual goal for next year is to explore ways to further strenghten the college/AVC relationship. (The college's Automated Industrial Center will be located in the Area Vocational Center.) Another is the creation of a Partnership Center for Educational Excellence, a staff development project sponsored by the CLC Foundation and the County Superintendent of Schools office.

The real strength of the college is not in its physical plant or technology, necessary as they are to the fulfillment of its mission, but in the people who serve and are attracted to the college for whatever reason. Future development depends upon enhancing relationships between these people as programmatic changes are made to keep pace with technological change. The most important relationships, of course, are those involving students.

There are numerous issues regarding how students can be served best. These issues build and lead to questions of organization and staff development and budgeting. The basic issues in student development, however, are these three: *access, standards,* and *curriculum.* As it moves to a new plateau of development, the college is trying to confront these issues by finding new patterns for enrollment management and new support systems for students.

Focusing on Student Needs

The first issue involving students concerns access to the college. Community colleges follow an "open door" policy -- admitting all applicants to the college regardless of background. This does not mean, however, that they should be allowed to enroll in any program regardless of their readiness to receive instruction. In too many cases, the "open door"is a *revolving door* for students who lack the requisite skills to succeed in college level courses. Their failure is a tragic loss of opportunity which need not occur if proper placement and remedial instruction is provided.

The second, related issue concerns appropriate standards. All courses should lead to a competency or skill or greater level of understanding and appreciation. Adherence to standards means that expected outcomes have been clearly achieved. It

is not likely that simple "true-false" or "fill-in-the-blanks" testing can verify learning if it has been worthwhile. If knowledge or skill has been learned, it can be communicated or demonstrated in precise forms.

Third is the issue of relating one course to another so that a meaningful curriculum is followed. Students need advisement and support in defining their educational goals and in monitoring their progress. This integrity of a curriculum path also means that the instruction and supporting equipment and materials must be current with the field.

Focusing on student needs calls for analysis of the student clienteles as well as programs analysis. Community colleges have similar missions, but their environments may differ dramatically.

Lake County is a very diverse socio-economically and has a heterogeneous population. These characteristics are reflected in the CLC student population. There is a wide range of differences in student age (from eighteen to eighty), interest, and maturity -- which may be the most important factor in ability to gain from education. CLC faculty enjoy having older students in their classes. Nor would it be correct to assume that all CLC students are without higher education experience; increasingly, college graduates with bachelor and master's degrees are enrolling for continuing education classes and technical programs.

Finally, S A T scores do not tell the whole story; courage, drive, curiosity all color the descriptions of what happens to students. Our faculty can recite many examples of excellence pursued and achieved from humble beginnings as well as very confident beginnings.

Though it cannot be all things to all people, the college attempts to respond to the diversity and heterogeneity of its district. Though it is not error-free, the college has become established as one of Lake County's strongest resources. And though it is ever subject to external forces and need for support, the college has a planning process for facing the challenges of technological change and educational reform.

Every writer has an obligation to cite the sources of information he has used. It may also be interesting to the reader to know these sources, which are available to him as well.

Following are some of the background reading materials relied upon for this series of articles:

Issues in Science and Technology, Winter 1985 and Spring 1985; **High Technology,** especially October 1984 issue, *"The Great Debates: Technology and National Policy"*; **Breakthrough by Boardroom Reports,** November 1, 1984 to April 15, 1985; **Educom** Bulletins, especially article by Frederic G. Withington on *"Limits of Key Technologies"* in Winter 1984 issue; **Science Digest,** especially May 1985 issue in Bio-Engineering; American Association of Higher Education publications, especially **Computers on Campus: Working Papers,** 1983-84; Daniel Yankelovich and John Immerwahr, **The Work Ethic and Economic Vitality,** prepared for Wharton/Reliance Symposium, May 1-3, 1983; also Daniel Yankelovich, *"Information, Judgement and Consensus,"* **Kettering Review,** Summer 1983; Henry M. Levin and Russel W. Rumberg, **The Educational Implications of High Technology,** Stanford University, February 1983; **CAM Reports,** East Lansing, Michigan 1984-85.

For information on "intelligent buildings," I am indebted to Dave G. Houser, *"Architecture with an I Q ,"* **Sky** Magazine, April 1985.

I am also grateful to Abbott Laboratories for allowing me to tour its new plant in North Chicago before it was sterilized to go on-line, and to many professional people who have shared their knowledge and insights with me, especially my colleagues at the College of Lake County.

I am alone responsible, of course, for any errors of fact or interpretation in this series. As Will Rogers said, "It ain't what we don't know that gets us into trouble -- it's what we do know that ain't so."

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